

ART. XV.—*The Pineal Eye of Mordacia mordax.*

With Woodcut.

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In 1883,* Ahlborn published an account of the structure of the Pineal gland in the lamprey *Petromyzon*; the discovery and investigation of the structure of the Pineal eye in *Lacertilia* some three years later, led Beard† to investigate the nature of the Pineal gland in *Cyclostomata*, and his full results published in 1888 showed that, as in lizards, the distal part of the gland was, in certain *Cyclostomata*, transformed into an eye-like structure, though one not so highly developed as in the former group.

His work was done upon *Petromyzon* and the larval form *Ammocoetes*, and upon *Myxine*. In these three he found, though not constantly, that pigment was deposited around the cells forming the vesicle of the epiphysis.

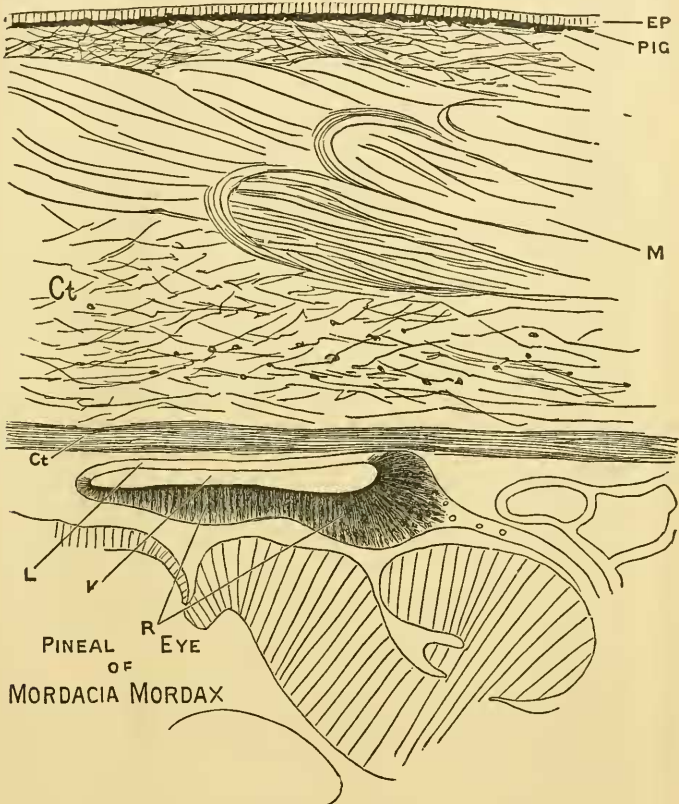
He was unable to secure a specimen of the Australian form *Mordacia*, and I am indebted to the kindness of Professor McCoy for placing at my disposal a specimen of the latter genus, upon an investigation of which this note is based. The specimen was obtained in Victoria, and Professor McCoy tells me that he has identified this with the Tasmanian form.

Ahlborn had already described in detail the relationship of the epiphysis to the brain and its union with the left ganglion habenulæ, and the division of its distal or vesicular portion into two parts—an upper larger, and a lower smaller vesicle. It was, in fact, simply Ahlborn's misfortune in not meeting with a specimen in which dark pigment was developed which prevented him from first discovering, by

* "Untersuchungen über das Gehirn von Petromyzonten."—*Zeitschr. für Wiss. Zool.*, Bd. xxxix., Heft. 2, 1883.

† "The Parietal Eye of the Cyclostome Fishes."—*Q.J.M.S.*, 1888; also *Nature*, July 14, 1887.

actual investigation, the true nature of the epiphysis, though both he and Rabl Rückhard had independently arrived at the conclusion that the Pineal eye was to be regarded as the rudiment of an unpaired eye.



DESCRIPTION OF WOOD CUT.

MEDIAN LONGITUDINAL VERTICAL SECTION THROUGH A PART OF THE HEAD OF *MORDACIA MORDAX* IN THE REGION OF THE PINEAL EYE.

Ct.—Connective tissue.

Ep.—Epidermis.

L.—Lens part of the eye.

M.—Muscles.

Pig.—Pigment immediately beneath epidermis.

R.—Retina.

V.—Vesicle of eye filled with fluid during life.

The brain of the specimen examined by myself was not, unfortunately, in a good state of preservation, not having been intended especially for histological work. Externally there was when preserved in spirit no indication of the presence of a Pineal eye. In a specimen of *Petromyzon* which has lain for some time in turpentine so as to render the tissues somewhat transparent, there is a strongly marked white spot indicating the epiphysis lying beneath, but in *Mordacia* no such indication was visible.

Longitudinal vertical sections, however, revealed the fact that the larger vesicle is attached by a stalk to the dorsal surface of the brain, and that in its walls an abundant deposit of pigment of a dark brown colour is developed.

The vesicle is of large size, and is flattened out against the roof of the brain case, and it may perhaps be due to the state of preservation of the brain in the particular specimen examined, but I could find no trace of the lower of the two vesicles normally present in *Cyclostomata*.

The eye stretches forward much compressed dorso-ventrally, and overlaps the cerebral hemispheres, its posterior end being continuous with the optic stalk, and being somewhat swollen out. Its walls are composed of long rod-like cells embedded in brown pigment, and facing into the cavity of the vesicle. These cells are longest at the posterior end, where the stalk joins the vesicle, resembling thus the eye in many *Lacertilia*, and the whole structure is very similar to that figured by Beard as present in *Petromyzon*.* The rod-cells appear to be in connection at their outer ends with nuclei, though these could not be detected with absolute certainty, owing to the incomplete histological state of the brain. My experience of other Pineal eyes makes me have little doubt, however, that they are present.

Of a true lens, that is of a cellular structure which could serve to focus rays of light entering the eye, it must be confessed, that neither here nor in the specimens figured by Beard, can one be said to be present. The vesicle wall is complete, and anteriorly consists simply of a comparatively thin layer, in which no pigment is deposited, and through which rays could easily pass to impinge upon the retina beneath. The layer appears to be of equal thickness all the way across, and there is no median swelling out, such as is

* *Op. cit.* Pl. VI., Fig. 1.

so constantly seen in the Lacertilia, nor in the specimen examined could the outlines of cells be in any way distinguished owing, again, doubtless, to the bad state of preservation.

The cavity of the vesicle, as in Ahlborn's and Beard's specimens, is apparently filled with fluid which coagulates when preserved in spirit.

In two points, with regard to the eye, *Mordacia* differs from *Petromyzon* as described by Beard:—

First, although the pigment is very well developed the eye is not placed in a deep depression of the skull, the latter passing quite evenly above the epiphysis. Beard points out the curious fact that in *Petromyzon*, when the pigment is well developed, the depression is deep; when absent, the depression is almost or entirely absent.

Secondly, the pigment in the skin (pig.) passes straight over the eye which would render it difficult and, when added to the layer of muscle and skeleton above the epiphysis, practically impossible for rays of light to reach the structure. In *Petromyzon*, Beard states that the pigment in the skin is absent above the eye.

There can be little doubt that here, as I believe, in all other animals in which it is now found, the Pineal eye must, as an organ for the perception of rays of light, be regarded as rudimentary and functionless.
